

## AMENDMENTS

Please amend the application as indicated hereafter.

### In the Specification

Please substitute the following clean copy paragraph/page text for the pending paragraph/page text of the same number.

In the paragraph that spans page 1, lines 7-16:

B<sub>1</sub>

---

This application is a division of U.S. Application Serial No. 08/932,025, now U.S. Pat. No. 6,258,287, entitled 'Method And Apparatus For Low Energy Electron Enhanced Etching of Substrates in an AC or DC Plasma Environment, filed September 17, 1997, which claims priority to and the benefit of the filing date of Provisional Patent Application Serial No's. 60/026,985, filed September 20, 1996, entitled "APPARATUS AND PROCESS FOR LOW-DAMAGE DRY ETCHING OF INSULATORS BY LOW ENERGY ELECTRON ENHANCED ETCHING IN A DC PLASMA"; 60/026,587, filed September 20, 1996, entitled "APPARATUS AND PROCESS FOR LOW-DAMAGE DRY ETCHING OF INSULATORS BY LOW ENERGY ELECTRON ENHANCED ETCHING IN AN AC PLASMA"; and U.S. Patent Application Serial No. 08/705,902, now U.S. Patent No. 5,882,538, filed on August 28, 1996 entitled "METHOD AND APPARATUS FOR LOW ENERGY ELECTRON ENHANCED ETCHING OF SUBSTRATES".

---

In the paragraph that spans page 4, lines 19-28, and page 5, lines 1-5:

B<sub>2</sub>

---

Placing the sample to be etched on the anode within a DC plasma environment is one way to ensure precise control over the anisotropic etching process while minimizing damage to the

B2  
cont

substrate and is described in commonly assigned U.S. Patent No. 5,882,538, filed August 28, 1996 and entitled "METHOD AND APPARATUS FOR LOW ENERGY ELECTRON ENHANCED ETCHING OF SUBSTRATES". This technique is called *Low Energy Electron Enhanced Etching* (LE4, for convenience), and operates by placing the etching substrate on the anode of a DC glow discharge. This method works well for conducting and semi-conducting substrates, but is inherently problematic for etching non-conducting substrates such as insulators because, in the aforementioned method, the substrate sample is physically and electrically connected to the anode in the plasma, thus becoming a conducting element of the electrical circuit within the plasma. An insulator, by definition does not efficiently conduct electrical current; therefore, placing an insulating substrate on the anode will impede the electrical flow and will be an inefficient and nearly impossible way to etch a non-conducting substrate.

---

In the paragraph that spans page 9, lines 19-26:

---

B3

In a variation of this third embodiment, for etching conducting substrates, the sample is placed upon the anode of a dc plasma reactor as described in commonly assigned U.S. Patent No. 5,882,538, filed August 28, 1996 and entitled "METHOD AND APPARATUS FOR LOW ENERGY ELECTRON ENHANCED ETCHING OF SUBSTRATES", however as an improvement thereon, the additional structure as described above is placed within the plasma in close proximity to the sample, thus allowing improved precise control over the flux and energy of charged species being imparted to the sample.

---

In the paragraph that spans page 13, lines 10-22:

B4  
In all embodiments that use conductors to generate the low energy electrons desired to form the plasma flux, the cold cathode can be a hollow cathode formed with permeable, meshed, or perforated, generally referred to as permeable, walls rather than the typical solid walls. The cathode may be cylindrically shaped with a side wall of a permeable conductive material, such as stainless steel mesh, and having one end that is open or closed and an open end. The cathode is connected to a cathode mounting post and to the power supply. The cathode may comprise a plurality of nested sidewalls; each connected to the power supply. The use of this cathode allows the generation of a large flux of low energy electrons at low pressure and temperature. A cathode made in accordance with that described is described in commonly assigned U.S. Patent No. 5,917,285, filed July 23, 1997, entitled "APPARATUS AND METHOD FOR REDUCING OPERATING VOLTAGE IN GAS DISCHARGE DEVICES".

In the paragraph that spans page 19, lines 4-13:

B5  
Cathode 56 is mounted in the plasma chamber 11. Cathode 56 is preferably a cold cathode, sometimes referred to as a field emission cathode, meaning it functions without the application of heat. The cathode is activated using external power source 54 that applies a direct current (DC) voltage between cathode 56 and anode 51. Because the chamber contains a gas, the chamber functions as a DC glow-discharge tube or DC plasma reactor. The cathode may be a standard cold cathode such as are known in the art or one constructed in accordance with the teaching of commonly assigned U.S. Patent No. 5,917,285, filed July 23, 1997, entitled

“APPARATUS AND METHOD FOR REDUCING OPERATING VOLTAGE IN GAS DISCHARGE DEVICES”.

In the paragraph that spans page 26, lines 2-8:

An apparatus for low-damage, anisotropic etching of substrates having the substrate mounted upon a mechanical support located within an ac or dc plasma reactor. The mechanical support is independent of the plasma reactor generating apparatus and capable of being electrically biased. The substrate is subjected to plasma of low-energy electrons and a species reactive with the substrate. An additional structure capable of being electrically biased can be placed within the plasma to control further the extraction or retardation of particles from the plasma.